International Islamic University Chittagong

Department of Computer and Communication Engineering (CCE)

4th Semester

Final Exam, Autumn 2021

Course Code: **STAT-2401** Course Title: **Statistics.**

Time: 2 hours 30 minutes Full Marks: 50

(i) The figures in the right-hand margin indicate full marks

(ii) Course Outcomes and Bloom's Levels are mentioned in additional Columns

Course Outcomes (COs) of the Questions	
CO1	Demonstrate understanding of descriptive statistics by practical application of quantitative reasoning and to the solution of engineering problems with data visualization.
CO2	Will Be able to compute and interpret the results of correlation and regression.

Bloom's Levels of the Questions						
Letter Symbols	**R**	**U**	**App**	**An**	**E**	**C**
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

		Part A [Answer the questions from the followings]			
1.	a)	Define correlation. The following data relate to advertising expenditure (in lakhs taka) and sales (in million taka) of an engineering farm;. Advertising expenditure (in Lakhs Taka): 10, 15, 20, 22, 24, 25 Sales (in Million Taka): 15, 18, 22, 24, 32, 28 Compute the correlation coefficient between advertising expenditures and sales. Comment on your results.	CO2	E	5
1.	b)	Define regression. A survey firm studying the relation between Kilowatt-hours (thousands) used the number of rooms of a flat in a residential area. A random sample of 8 flats have the following data; Number of Rooms In a Flat : X: 5, 7, 4, 6, 5, 4, 5, 4 Kilowatt-hours (Thousand): Y: 7, 9, 6, 8, 7, 6, 7, 4 (i)Determine the regression line on Kilowatt-hours on the number of Rooms. (ii) Determine the expected number of Kilowatt-hours for 8-rooms flat.	CO2	E	5
2.	a)	Define probability and sample space. If you toss a fair coin 3 times, write the all possible sample points in this experiment.	**CO1**	**E**	5
2.	b)	Define Venn-diagram. In a company of 120 employees 80 are engineers, 75 are graduate, 50 Engineers are graduate. Show this information in a venn-diagram and identify the undergraduate Engineer marked with shaded area.	**CO1**	**E**	**5**

3.	a)	One hundred (100) students of CCE department sit an exam and the following data is recorded; **Student passed the Math Course / Student failed the Math Course / Total** Students passed the EEE Course: 40 / — / 60 Students failed the EEE Course: — / 10 / — Total: 70 / — / 100 Now you calculate and fill the remaining data. Also find the probability that (i) A student passed the math course (ii) A student passed the only EEE course (iii) A student passed at least one course	**CO1**	**E**	**5**
3.	b)	In a 3-child family, construct the sample space. Find the probability that a family has 2 girl babies; also find the probability of no boy baby in these 3-child families.	**CO1**	**E**	**5**
		Part B [Answer the questions from the followings]			
4.	a)	Define probability, mutually exclusive events and independent events. Find the mean and variance from the following table; Experience of the employees in a Textile Company (in Year) : X: 4 / 6 / 8 / 10 / 12 Probability :P(X=x): 0.15 / 0.30 / 0.30 / 0.15 / 0.10	CO1	An	5
4.	b)	Define mathematical expectation and variance. A random variable X has the following probability function Values of X : 1 2 3 4 5 6 P(X) : 0.1 2k 2k 0.3 0.1 0.1 i. Find the value of k ii. Evaluate (a) $P[X\leq 2]$ (b) $P[2\leq X\leq 4]$ iii. Calculate mean, standard deviation and coefficient of variation of X.	CO2	E	5
5.	a)	Define binomial distribution. A certain manufacturing process yield electrical fuses of which, in the long run 10% are defective which follows binomial distribution. Find the probability that in a sample of 6 fuses selected at random there will be (i) no defective (ii) No more than one defective.	CO1	U An	5
5.	b)	Define Poisson Distribution with some examples. The number of Website visitors per hour follows Poisson distribution with parameter m=2. Find the probability that (i) No people visit the Website in a particular hour (ii) Exactly one visitor visit the Website.	CO2	E	6
6.	a)	Define level of significance. The average salary of 17 engineers in a company is 40 thousand taka and sample standard deviation 10 thousand taka. Now test whether the populations mean salary is 45 thousand taka. (The tabulated t-value with 16 df is 2.12)	**CO1**	**Ap**	4

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<tr><td>6.</td><td>b)</td><td>Define Type-I and Type-II error. A set of 15 observations and another set of 14 observations in lea strength are measured and the output shown below;
<table>
<tr><td></td><td>Mean (in kg)</td><td>Standard Deviation (in kg)</td><td>Number of tests</td></tr>
<tr><td>Set-1</td><td>66.48</td><td>2.40</td><td>15</td></tr>
<tr><td>Set-2</td><td>64.00</td><td>2.70</td><td>14</td></tr>
</table>
Use the t-test to find whether two sets of data were drawn from population with same mean.(The tabulated t-value with 27 df is 2.052)</td><td>CO1</td><td>E</td><td>6</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>7.</td><td>a)</td><td>What are the steps of test procedure? An automobile company usually produces three-cylinder model car whose mean petrol consumption is 15 km/liter. But company launches a new four-cylinder car whose mean petrol consumption is claimed to be lower than that of existing auto engine. It is found that the mean consumptions of 20 sampled cars are 20 km/liters with an standard deviation 1.5 km/liter. Test for the hypothesis at 5% level of significant whether the new models petrol consumptions is equal to the existing model. .(The tabulated t-value with 19 df is 2.093)</td><td>CO1</td><td>Ap</td><td>4</td></tr>
<tr><td>7.</td><td>b)</td><td>The following data represent the blood sugar of a group of patients before (B) and after (A) a specific treatment;
<table>
<tr><td>Blood Sugar (B)</td><td>14.2</td><td>14.6</td><td>15.6</td><td>12.0</td><td>13.8</td><td>15.5</td><td>18.0</td></tr>
<tr><td>Blood After (A)</td><td>10.0</td><td>09.5</td><td>11.0</td><td>10.2</td><td>08.6</td><td>10.2</td><td>15.6</td></tr>
</table>
(i) Now formulate the null hypothesis to test the treatment is successful or effective.
(ii) Write the test statistic to verify the effectiveness of the treatment.
(iii) Test the null hypothesis mentioned in (i) and comment.</td><td>CO1</td><td>E
C</td><td>6</td></tr>
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